

# CONNECTING the CONCEPTS

## Zeros, Solutions, and Intercepts

The zero of a linear function  $f(x) = mx + b$ , with  $m \neq 0$ , is the solution of the linear equation  $mx + b = 0$  and is the first coordinate of the  $x$ -intercept of the graph of  $f(x) = mx + b$ . To find the zero of  $f(x) = mx + b$ , we solve  $f(x) = 0$ , or  $mx + b = 0$ .

### FUNCTION

#### Linear Function

$$f(x) = 2x - 4, \text{ or}$$

$$y = 2x - 4$$

### ZERO OF THE FUNCTION; SOLUTION OF THE EQUATION

To find the zero of  $f(x)$ , we solve  $f(x) = 0$ :

$$2x - 4 = 0$$

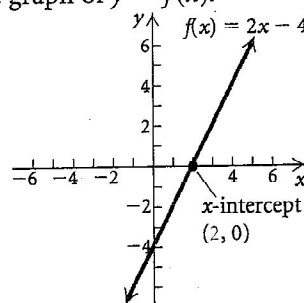
$$2x = 4$$

$$x = 2.$$

The solution of  $2x - 4 = 0$  is 2.  
This is the zero of the function  
 $f(x) = 2x - 4$ . That is,  $f(2) = 0$ .

### ZERO OF THE FUNCTION; X-INTERCEPT OF THE GRAPH

The zero of  $f(x)$  is the first coordinate of the  $x$ -intercept of the graph of  $y = f(x)$ .



## 1.5

## Exercise Set

Solve.

1.  $4x + 5 = 21$

2.  $2y - 1 = 3$

13.  $8 = 5x - 3$

14.  $9 = 4x - 8$

3.  $23 - \frac{2}{5}x = -\frac{2}{5}x + 23$

4.  $\frac{6}{5}y + 3 = \frac{3}{10}$

15.  $\frac{2}{5}y - 2 = \frac{1}{3}$

16.  $-x + 1 = 1 - x$

5.  $4x + 3 = 0$

6.  $3x - 16 = 0$

17.  $y + 1 = 2y - 7$

18.  $5 - 4x = x - 13$

7.  $3 - x = 12$

8.  $4 - x = -5$

19.  $2x + 7 = x + 3$

20.  $5x - 4 = 2x + 5$

9.  $3 - \frac{1}{4}x = \frac{3}{2}$

10.  $10x - 3 = 8 + 10x$

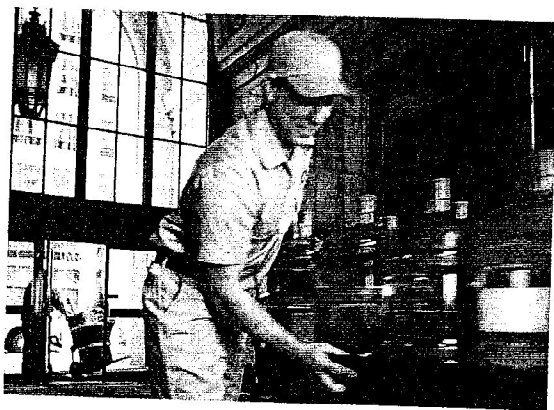
21.  $3x - 5 = 2x + 1$

22.  $4x + 3 = 2x - 7$

11.  $\frac{2}{11} - 4x = -4x + \frac{9}{11}$

12.  $8 - \frac{2}{9}x = \frac{5}{6}$

23.  $4x - 5 = 7x - 2$   
 24.  $5x + 1 = 9x - 7$   
 25.  $5x - 2 + 3x = 2x + 6 - 4x$   
 26.  $5x - 17 - 2x = 6x - 1 - x$   
 27.  $7(3x + 6) = 11 - (x + 2)$   
 28.  $4(5y + 3) = 3(2y - 5)$   
 29.  $3(x + 1) = 5 - 2(3x + 4)$   
 30.  $4(3x + 2) - 7 = 3(x - 2)$   
 31.  $2(x + 4) = 3 - 5(2x + 1)$   
 32.  $3(2x - 5) + 4 = 2(4x + 3)$   
 33. *Bottled-Water Sales.* Wholesale sales of bottled water in the United States in 2006 were \$10.6 billion. This was an increase of about 54% over sales in 2001. (Source: Beverage Marketing Corporation) Find the wholesale sales of bottled water in the United States in 2001.



34. *Oil Consumption.* Projections indicate that the global demand for oil will be 103 million barrels per day in 2015. This is about a 23% increase over the daily demand in 2005. (Source: U.S. Energy Information Administration) What was the daily global demand for oil in 2005?

35. *Credit-Card Debt.* For households with at least one credit card, the average U.S. credit-card debt per household was \$9312 in 2004. This was \$6346 more than the average credit-card debt in 1990. (Source: CardWeb.com) What was the average credit-card debt per household in 1990?
36. *Bald-Eagle Population.* There are 7066 known nesting pairs of bald eagles in the lower 48 states today. This is 6649 more pairs than in 1963. (Source: U.S. Fish and Wildlife Service) How many nesting pairs of bald eagles were there in the lower 48 states in 1963?



37. *Data Storage.* As consumers fill electronic devices with digital photos and music, storage needs for digital data are soaring. It is estimated that the amount of digital data stored on various devices in a typical U.S. household in 2010 will be 4430 gigabytes (GB). This is 4024 GB more than the amount of data stored in 2004. (Source: Coughlin Associates) Find the amount of digital data stored on various devices in a typical household in 2004.
38. *Where the Textbook Dollar Goes.* Of each dollar spent on textbooks at college bookstores, 23.2 cents goes to the college store for profit, store operations, and personnel. On average, a college student at a four-year college spends \$940 per year for textbooks. (Source: College Board) How much of this expenditure goes to the college store?

39. *Visitors to National Parks.* The two most visited national parks are the Great Smoky Mountains and the Grand Canyon. In 2005, there was a total of 13.6 million visitors to these two parks. Great Smoky Mountains Park had 4.8 million more visitors than the Grand Canyon. (Source: National Park Service) How many visitors did each park have?



40. *Nutrition.* A slice of carrot cake from the popular restaurant The Cheesecake Factory contains 1560 calories. This is three-fourths of the average daily calorie requirement for many adults. (Source: The Center for Science in the Public Interest) Find the average daily calorie requirement for these adults.
41. *Television Viewers.* In a recent week, the television networks CBS, ABC, and NBC together averaged a total of 29.1 million viewers. CBS had 1.7 million more viewers than ABC and NBC had 1.7 million fewer viewers than ABC. (Source: Nielsen Media Research) How many viewers did each network have?
42. *Nielsen Ratings.* Nielsen Media Research surveys TV-watching habits and provides a list of the 20 most-watched TV programs each week. Each rating point in the survey represents 1,102,000 households. One week "60 Minutes" had a rating of 11.0. How many households did this represent?
43. *Amount Borrowed.* Tamisha borrowed money from her father at 5% simple interest to help pay her tuition at Wellington Community College. At the end of 1 yr, she owed a total of \$1365 in principal and interest. How much did she borrow?

44. *Amount of an Investment.* Khalid makes an investment at 4% simple interest. At the end of 1 yr, the total value of the investment is \$1560. How much was originally invested?
45. *Sales Commission.* Ryan, a consumer electronics salesperson, earns a base salary of \$1500 per month and a commission of 8% on the amount of sales he makes. One month Ryan received a paycheck for \$2284. Find the amount of his sales for the month.
46. *Commission vs. Salary.* Juliet has a choice between receiving an \$1800 monthly salary from Furniture by Design or a base salary of \$1600 and a 4% commission on the amount of furniture she sells during the month. For what amount of sales will the two choices be equal?
47. *Cab Fare.* City Cabs charges a \$1.75 pickup fee and \$1.50 per mile traveled. Diego's fare for a cross-town cab ride is \$19.75. How far did he travel in the cab?
48. *Hourly Wage.* Soledad worked 48 hr one week and earned a \$442 paycheck. She earns time and a half (1.5 times her regular hourly wage) for the hours she works in excess of 40. What is Soledad's regular hourly wage?



49. *Angle Measure.* In triangle  $ABC$ , angle  $B$  is five times as large as angle  $A$ . The measure of angle  $C$  is  $2^\circ$  less than that of angle  $A$ . Find the measures of the angles. (Hint: The sum of the angle measures is  $180^\circ$ .)